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THE BRYOLOGIST

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NOTES ON NORTH AMERICAN HEPATICAE—IX*

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(WITH PLATE I)

In the first paper of this series *Riccia dictyospora* M. A. Howe was reported from Missouri,[1] and in the second paper *R. californica* Aust. was reported from British Columbia.[2] Howe has lately shown that these reports were based on incorrect determinations. He refers the Missouri specimens to his recently described *R. McAllisteri*[3] and the British Columbia specimens to *R. Beyrichiana* Hampe. Attention may be called also to *Sphenolobus groenlandicus* (Nees) Steph. and *Lophozia murmanica* Kaalaas, two species which have been recognized as members of the arctic American flora. According to Müller[4] these species are indistinguishable from each other and represent a synonym (or perhaps a variety) of *L. Wenzelii* (Nees) Steph., a variable and widely distributed plant of arctic and alpine regions.

In the present paper four other species are reduced to synonymy, a *Diplophyllum* from North Carolina and Tennessee is proposed as a new species the perichaetial bracts and perianths of *Ptychocoleus heterophyllus* are described for the first time, and Conklin's report of *Gymnomitrium varians* as a North American plant is confirmed; the remaining species are included to record extensions of range.

1. BLASIA PUSILLA L.

Collected in 1873–75 near Loma Parda, Rio Grande, New Mexico, by the botanists of the Wheeler Expedition. This is apparently the first record of the species for New Mexico, since it is not included in either of Standley's lists.[5]

2. GYMNOMITRIUM VARIANS (Lindb.) Schiffn.; Engler & Prantl, Nat. Pflanzenfam **1**^{3}: 77. 1893. *Nardia varians* Lindb. Musc. Scand. 9. 1879. *Gymnomitrium crassifolium* Carringt. Trans. Bot. Soc. Edinburgh **13**: 461. *pl. 18, f. 3*. 1879. *Sarcoscyphus confertus* Limpr. Jahresb. Schles. Gesell. Vaterl. Cultur **57**: 312. 1880. *Gymnomitrium confertum* Limpr. Flora **64**: 73. 1881. *Marsupella conferta* Spruce, Rev. Bryol. **8**: 95. 1881. *Gymnomitrium ambiguum*

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* Contribution from the Osborn Botanical Laboratory.

[1] BRYOLOGIST **13**: 33. 1910.

[2] BRYOLOGIST **14**: 84.84. 1911.

[3] See BRYOLOGST **20**: 35. 1917.

[4] Rabenhorst's Kryptogamen-Fl. **6**^{2}: 762. 1916.

[5] BRYOLOGIST **18**: 81–83. 1915; **19**: 64, 65. 1916.

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Limpr.; Massalongo & Carestia, Nuovo Gior. Bot. Ital. **14**: 218. 1882. *Cesia variana* Lindb. Meddel. Soc. F. et Fl. Fenn. **13**: 238. 1886. *C. crassifolia* Lindb. *l. c.* **14**: 48. 1888. *Acolea varians* Steph. Bull. Herb. Boissier II. **1**: 149 [Sp. Hepat. **2**: 10]. 1901. *A. crassifolia* Steph. *l. c.* II. **1**: 150. 1901. *Cesia conferta* Pears. Hep. British Isles 397. *pl. 175.* 1901.

Collected in August, 1913, at and near Simpson Pass, vicinity of Banff, British Columbia, 6750–7400 feet altitude, on wet or moist earth, by A. Brinkman (Nos. 904, 937, 963, 973, 978). These specimens have already been reported, without definite localities, by Conklin.[6] They represent an addition to the North American flora.

The long synonymy brings out the interesting fact that *G. varians* was independently described as new by Lindberg, by Carrington, and by Limpricht at about the same time. Lindberg's species was based on Norwegian material, Carrington's on Scottish, and Limpricht's on Austrian. The plant has a wide distribution in Europe and is distinctly arctic-alpine in its range, often appearing close to the snow line and sometimes forming extensive mats of a dark brown or blackish hue. The lack of a perianth around the young sporophyte shows that the species is a *Gymnomitrium*, rather than a *Marsupella*, and the dark color indicates that it should be assigned to the subgenus *Homocraspis*. So far as known the only other North American representative of this subgenus is *G. revolutum* (Nees) Philibert, which has been reported from Greenland, but other species are doubtless to be expected.

There is a little danger of confusing *G. varians* with any of our other species of *Gymnomitrium*. It bears a strong resemblance, however, to *Marsupella ustulata* (Hüben.) Spruce, which grows in somewhat similar localities. So far as the leaves are concerned the two species are strikingly alike. The lobes in both cases are acute or subacute, the sinus is acute, and the depth of the sinus is one third of less the length of the leaves. The median leaf-cells, moreover, measure 12–18μ in width, and the cell-walls have more or less evident trigones. Of course the presence of a perianth in the *Marsupella* will at once serve to distinguish it, and the constantly paroicous inflorescence is likewise a distinctive feature. In *Gymnomitrium varians* the inflorescence is sometimes paroicous, but the antheridia are often borne on separate branches or even on distinct plants. In *G. crassifolium* the inflorescence is said to be constantly dioicous, and European writers still recognize its validity on the basis of this character, although they admit that its claims are exceedingly doubtful. Another species, which should probably be included among the synonyms of *G. varians*, is *G. cochleare* (Lindb.) K. Müll. of Norway. As Müller states the distinctive features of this species are very vague, and he predicts that it will be regarded in the future as nothing more than a small form of *G. varians.*[7]

3. JUNGERMANNIA PECKII Aust.; Peck, Ann. Rep. Regents Univ. State New York **19**: 68. 1866. "Decayed wood Sand Lake [New York]."

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[6] BRYOLOGIST **17**: 14. 1914.

[7] Rabenhorst's Kryptogamen-Fl. **6**: 431. 1909.

In a little known paper entitled, "List of mosses of the state of New York," and published in the place indicated above, Peck included the following three manuscript species of Austin: *J. Sullivantiana*, *J. Lescuriana* and *J. Peckii*. In connection with each of these species a full description by Austin is given. Since these were probably the earliest of Austin's species to be published and since the later literature of the Hepaticae makes no allusion to them, the writer appealed to Professor Peck a number of years ago for information about them and about the specimens upon which they were based. Professor Peck kindly sent a plant of *J. Peckii* for examination but stated that the other two species were not represented in the herbarium at Albany. In the writer's opinion *J. Peckii* is a simple synonym of *Harpanthus scutatus* (Web. & Mohr) Spruce, a species with which Austin himself compared it. The other two species can hardly be determined from Austin's descriptions. In all probability *J. Sullivantiana* is a species of *Cephaloziella*, and *J. Lescuriana* may perhaps belong to the same genus.

4. JUNGERMANNIA RAUANA Steph. Bull. Herb. Bossier II. **1**: 511 [Sp. Hepat. **2**: 73]. 1901. "Hab. *America sept.* Washington Terr. (Rau)."

According to the original description of this species it is characterized (among other features) by a dioicous inflorescence, by a lack of cauline underleaves, by adnate and entire perichaetial bracts, by variously cleft or laciniate perichaetial bracteoles, and by a clavate-cylindrical perianth densely setose at the mouth. Since some of these peculiarities are inconsistent with the genus *Jungermannia* as defined by most students of the Hepaticae, the writer was especially anxious to study the type material, in order to confirm or correct Stephani's observations.

Upon making inquiries of Mr. Eugene A. Rau, of Bethlehem, Pennsylvania, in whose honor the species was named, it was learned that he had never collected hepatics in the state of Washington and that he had no specimens in his herbarium bearing the name *J. Rauana*. The type locality of the species therefore became problematical. Though the kindness of Professor R. Chodat, of the University of Geneva, the writer has since obtained a portion of the type from the Stephani collection, now included in the Boissier Herbarium. This specimen shows beyond a doubt that *J. Rauana* is a synonym of *Jamesoniella autumnalis* (DC.) Steph. An adnation of the perichaetial bracts, which is ascribed to the species, is not shown; although the upper portion of the stem, to which the bracts are attached is swollen, the long-exserted perianth takes its origin above the line of attachment of the innermost bracts. Not only is this the case, but the bracts, although usually entire, occasionally show basal cilia. *Jamesoniella autumnalis* has a wide distribution in Europe, Asia and North America. In the eastern parts of Canada and the United States it is one of our commonest species. On the Pacific Coast, where it seems to be rarer, it has been reported byMacoun from several stations in British Columbia, so that its occurrence in the neighboring state of Washington would naturally be expected. It is unfortunate that there is so much uncertainty about the locality where Stephani's specimen was collected.

5. PLAGIOCHILA SMALLII Evans, Bull. Torrey Club **32**: 180. *pl. 5, f. 1-8.* 1905.

Collected in February, 1918, at Las Ninfas, Cuba, by Brother Hioram (No. 2022); also in June, 1921, at Lake Cunningham, New Providence, Bahama Islands, by L. J. K. Brace. These specimens, which represent interesting extentions of range, were both received from the New York Botanical Garden. The species was based on material collected by J. K. Small and others in the southern part of Florida. It has since been found in various other localities in the same general region and has likewise been reported from Bermuda. It is the second species of *Plagiochila* to be recorded from the Bahama Islands. Its discovery in Cuba brings up again its relationship to the Cuban *P. diffusa* Steph., a species with which it was originally compared, and arouses the suspicion that the two species may be synonymous. The Cuban specimen, however, shows clearly the distinctive features of the species, and no connecting links between *P. Smallii* and *P diffusa* have as yet been brought to light.

6. CALYPOGEIA ACUTA Steph. Bull. Herb. Boissier II. **8**: 668 [Sp. Hepat. **3**: 400]. 1908. "Hab. America septentr. Pennsylvania (Rau)."

A portion of the type material of *C. acuta*, kindly forwarded by Professor Chodat, gives the additional information that it was found at Bethehem in 1883. In his treatment of the genus *Calypogeia* Stephani arranges the species in three groups characterized, respectively, by obtuse or truncate leaves, by acute leaves, and by bidentate leaves. The only North American species which he places in the second group is *C. acuta*, and he describes the cauline leaves of this species as 1.5 mm. long, crowded, spreading at a right angle, broadly ovate-triangular, and acute at the apex. The type specimen shows that the last feature is by no means constant. Most of the leaves, especially on robust stems, are either rounded at the apex or very obtusely pointed. On some of the more slender axes acute leaves occasionally occur, but even here blunt leaves are in the majority. In the common *C. Trichomanis* (L.) Corda a similar diversity in the leaf-apices is often encountered, and acute leaves may be even more numerous than blunt leaves on plants growing in unfavorable localities. The writer would therefore include *C. acuta* among the synonyms of *C. Trichomanis*, since the difference in the leaf-apices breaks down and since no other differences are brought out either by the original description or by the type material.

7. **Diplophyllum Andrewsii** sp. nov.

Collected on July 8, 1919, on ground near Bee tree Creek, Buncombe County, North Carolina, by A. Le Roy Andrews (No. 117); also on July 31, 1919, on ground along roadside near Burbank, at foot of Roan Mountain, Tennsssee, by the same collector (No. 189)[8]. No. 117 may be designated the type.

Yellowish or brownish green, sometimes becoming bleached with age, growing in tufts or in small mats and often mixed with other bryophytes: stems with ascending or suberect tips but prostrate and densely radiculose in the older parts with colorless rhizoids, mostly 3–5 mm. long and 0.15–0.2 mm. in diameter, sparingly branched, the branches soon becoming separated as distinct individuals; leaves at first loosely to closely imbricated, often becoming scattered with age, unequally complicate-bilobed to about the middle; dorsal lobe suberect to obliquely spreading, ovate, when well developed 0.65–0.85 mm. long and 0.4–0.45 mm. wide, but sometimes considerably smaller, almost transversely attached and not decurrent, broad and rounded at the apex, entire; ventral lobe widely spreading, ovate to oblong, when well developed 1–1.15 mm. long and 0.5–0.6 mm. wide, attachment and apex similar to those of the dorsal lobe, margin usually entire throughout but sometimes with vague indications of minute rounded projections close to the base; keel sharp. straight or slightly incurved; leaf-cells with slightly thickened walls and (in the middle of the lobes) vaguely defined trigones having concave sides, averaging about 10μ in width along the margin of the ventral lobe, 22 x 15μ in the median portion and 30–60 x 15μ toward the base, no distinct median band of elongated cells being differentiated; cuticle smooth or with very faint verruculae: inflorescence autoicous: ♂ inflorescence at first terminal on a more or less elongated axis, then proliferating vegetatively; bracts mostly in four to six pairs, at first imbricated, similar to the vegetative leaves but with more or less strongly arched keels; antheridia borne singly: ♀ inflorescence borne on a more or less elongated branch arising just below a ♂ inflorescence, the vegetative leaves mostly in two to four pairs, increasing in size upward; bracts mostly in one or two pairs, similar to the vegetative leaves but larger and with both lobes obliquely spreading to suberect, the dorsal lobe measuring about 1.35 x 0.75 mm. and the ventral about 1.5 x 0.85 mm.; perianth about half exserted or slightly more, oblong to obovate in outline, mostly 2–2.5 mm. long and 0.9–1 mm. wide, somewhat compressed, irregularly about ten-plicate in the upper part, the folds and grooves being rounded, but often narrow slightly contracted at the mouth and irregularly toothed, the teeth sharp, mostly one to five cells long and one to four cells broad at the base, some of the larger teeth bearing smaller secondary teeth on the sides: mature sporophyte and gemmae not seen. [PLATE 1, FIGS. 1–11].

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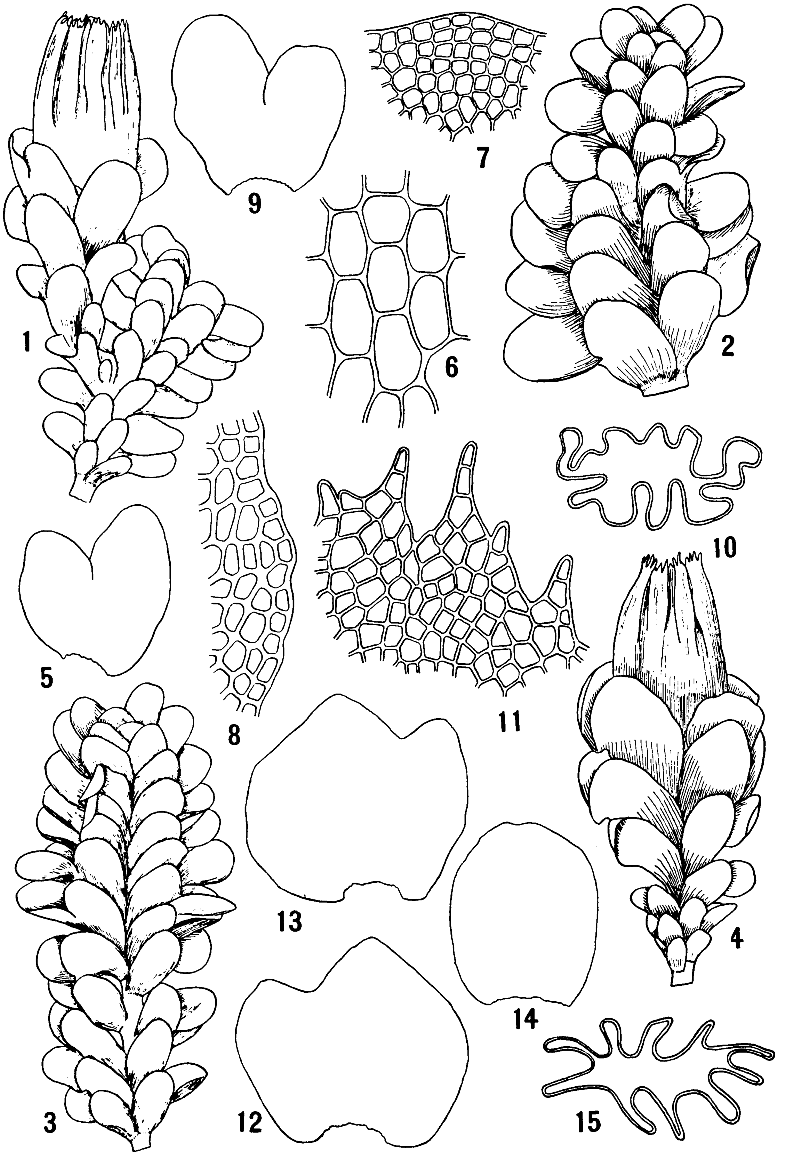
[8] Andrews has already reported these specimens under the name "*Diplophyllum* Sp." See BRYOLOGIST **24**: 52. 1921.

The writer takes pleasure in naming this well-marked species in honor of its discoverer, Professor A. Le Roy Andrews of Cornell University, President of the Sullivant Moss Society. The material collected is not abundant but is sufficient to bring out clearly the distinctive features of the plant.

Although in most cases the lobes of the leaves are plane or nearly so, they are sometimes more or less concave when viewed from above. This is especially likely to be the case with the ventral lobes, the margins of which may even be slightly involute. The verruculae, which are sometimes to be observed on the cuticle of the leaf-cells, are exceedingly pale and inconspicuous. In the middle of a lobe they are circular to oval in outline, perhaps half a dozen lying over each cell cavity; toward the base they become narrowly linear. Most of the leaf-cells, especially in the vicinity of the margin and apex, appear to be entirely free from verruculae of any sort.



1–11. DIPLOPHYLLUM ANDREWSII EVANS
12–15. PTYCHOCLEUS HETEROPHYLLUS EVANS

Owing to the ease with which female branches become detached, it is sometimes difficult to bring out the fact that the inflorescence is autoicous. In several cases, however, the writer has been able to demonstrate attached female branches, and these have always arisen, either singly or in a subopposite pair, just below a male inflorescence (FIG. 1). Even in the case of detached female axes it is usually easy to see that they are branches, since the basal leaves are always small and poorly developed (FIG. 4). If the inflorescence terminated a main axis, the leaves for a considerable distance below the bracts would naturally be vegetative leaves of the ordinary type. This seems to be true in the case of the male inflorescence, in all observed instances, so that the latter may be described as being borne on a main axis, rather than on a branch. Beyond the inflorescence the axis continues its growth vegetatively (FIGS. 2 and 3), but whether it eventually forms another series of bracts and antheridia has not yet been determined.

Among the North American species of *Diplophyllum*, *D. apiculatum* (Evans) Steph. and *D. obtusifolium* (Hook.) Dumort. seem to be the closest allies of *D. Andrewsii*. *D. apiculatum* is the common lowland species of the eastern United States, its known range extending from Maine to Georgia. It grows preferably on shaded banks and agrees with the new species in color and general habit and also in its autoicous inflorescence, the female branch normally arising just below the male inflorescence. The leaf-cells, moreover, are very much alike in the two species and the differences in the cell-measurements are almost negligible. In *D. apiculatum*, however, the plants are a trifle smaller, both leaf-lobes are almost invariably apiculate and the margin is often distinctly denticulate, especially toward the base of the ventral lobe. The perianth, also, although similarly compressed, has fewer folds in the upper part and the teeth at the mouth tend to be simpler and more crowded. *D. obtusifolium* is a species of wide European distribution, being most abundant in the lower mountains of France, Germany and Switzerland, but often descending to the sea level along the Atlantic Coast, In North America it seems to be confined to the Pacific Coast, being known only from British Columbia and Washington. This species likewise agrees with *D. Andrewsii* in general appearance and in size, and its leaf-lobes are similarly broad and rounded at the apex. It differs, however, in its inflorescence, which is normally paroicous, rather than autoicous, the male bracts being situated in several pairs just below the perichaetial bracts. The species is further distinguished by its relatively smaller dorsal lobes and by the distinct denticulation of the leaf-margins, not only in the vicinity of the base of the dorsal lobe but also in the apical portions of both lobes.

8. DIPLOPHYLLUM GYMNOSTOMOPHILUM Kaalaas.

Collected in 1917, at Middle Harbor, Dingwall, Cape Breton, Nova Scotia, on gypsum ledges, by G. E. Nichols; also in October, 1910, below the falls of the Black River, Douglas County, Wisconsin, on rock ledges, by G. H. Conklin (No. 959 in part). Both of these localities represent interesting extensions of range. The species was first recognized as American by Miss Lorenz, who collected it at Willoughby, Vermont in July, 1913[9]. She has since found it in the vicinity of Round Mountain Lake, Franklin County, Maine,[10] and at Quechee Gulf, Hartland, Vermont. The two localities noted above represent the only known North American stations outside New England. In Europe *D. gymnostomophilum* has a fairly wide distribution but is everywhere rare. It seems to be confined to calcareous regions.

9. TAXILEJEUNEA EROSIFOLIA Steph. Species Hepat **5**: 487. 1914. "Hab. *America septentrionalis*. Florida. Cuba."

A specimen of this species is in the Underwood Herbarium, now in the possession of the New York Botanical Garden. It was collected by J. Donnel Smith in Florida, no more definite locality being indicated on the label. In the writer's opinion this specimen clearly represents *T obtusangula* (Spruce) Evans, a species rediscovered in Florida by S. Rapp in 1913.[11] Most of the perianths present are old and battered, so that it is difficult to demonstrate their true features, but at least one of them shows the depressed and beakless mouth characteristic of Spruce's species. In all probability Stephani's description of *T. erosifolia* was drawn largely from the Underwood material, and it therefore seems safe to regard the species as a synonym of *T. obtusangula.*

10. PTYCHOCOLEUS HETEROPHYLLUS Evans, Am. Jour. Bot. **5**: 144. *f. 5.* 1918.

Collected in January, 1920, at Sandy Bay, Nicaragua, on the bark of trees and on decaying stumps, by K. Hamilton (Nos. 224, 225); specimens received from Dr. P. O. Schallert.

The present species was based in part on specimens from Florida, collected by S. Rapp, and in part on specimens from Honduras, collected by P. Wilson. These specimens were wholly without female inflorescences, so that their reference to the genus *Ptyohocoleus* rather than to *Brachiolejeunea* had to be provisional. The new material from Nicaragua bears female inflorescences without subfloral innovations and thus proves beyond a question that the species is a true *Ptychocoleus*.

The female branches are more or less elongated and the leaves show a gradual increase in size as the perianth is approached. The bracts are in two to five pairs. The innermost bracts (FIGS. 12 and 13) are complicate-bilobed about one fourth, with a rounded and wingless keel, which is straight or slightly arcuate. The lobe is broadly ovate, measuring about 1.2 x 0.9 mm., and tapers distinctly to a broad rounded or obtuse apex; the lobule is ovate-oblong, measuring about 1 x 0.5–0.6 mm. and less distinctly tapering. Both lobe and lobule are entire or nearly so. The bracteole, (FIG. 14), which is entirely free from the bracts, is oblong, measuring about 1 x 0.9 mm. and shows a broad rounded apex and entire margin, with little or no indication of basal auricles. Although the lobules of the bracts are often perfectly entire at the apex an occasional lobule shows a very shallow apical sinus with rounded lobes. So far as the lobules are concerned there is an abrupt transition between the lowest bract, the lobule of which has an entire margin, and the uppermost vegetative leaf, the lobule of which bears from five to seven teeth. The only perianths seen were imperfectly developed and did not project beyond the bracts. They show an oblong to obovate outline and are slightly compressed, but they are characterized chiefly by their ten narrow folds separated by deep grooves, the folds being rounded rather than sharp (Fig. 15).

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[9] See Evans, Rhodora **16**: 71. 1914. A discussion of the species, with synonymy, may be found here.

[10] See Evans, Rhodora **19**: 272. 1917.

[11] See BRYOLOGIST **17**: 90. 1914.

In the original account of *P. heterophyllus* it was compared with the South America *P. torulosus* (Lehm. & Lindenb.) Trevis., a somewhat larger plant with relatively broader leaf-lobes. It was shown that the two species had many feature in common and an additional resemblance is supplied by the perichaetial bracts and perianths, as a comparison of the figures in the present paper with Schiffner's figures of *P. torulosus* will clearly show[12]. In both species the lobules of the bracts are nearly as long as the lobe and the perianths are ten-plicate. In *P. torulosus,* however, the lobes of the bracts are much broader at the apex, which is either rounded or truncate, the bracteole is relatively broader, and the folds of the perianth are separated by shallower grooves.

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EXPLANATION OF PLATE I

DIPLOPHYLLUM ANDREWSII Evans

Fig. 1. Part of a plant bearing a male inflorescence and giving rise to a female branch with a perianth, dorsal view, x 15.

Fig. 2. Male inflorescence with vegetative proliferation, dorsal view, x 25

Fig. 3. Another male inflorescense with vegetative proliferation, dorsal view, x 15.

Fig. 4. Female branch with perianth, dorsal view, x 15.

Fig. 5. A leaf, spread out, x 25.

Fig. 6. Cells from the middle of a ventral lobe, x 265.

Fig. 7. Cells from the apex of a ventral lobe, x 200.

Fig. 8. Cells from the base of a ventral lobe, x 200.

Fig. 9. Perichaetial bract, spread out, x 15.

Fig. 10. Cross-section of a perianth in upper third, x 35.

Fig. 11. Teeth from the mouth of a perianth, x 200.

Figs. 1 and 2 were drawn from the Tennessee specimens and all the remaining figures from the type specimen.

PTYCHOCOLEUS HETEROPHYLLUS Evans

Figs. 12–14. Innermost bracts and bracteole from a female inflorescence, x 25.

Fig. 15. Cross-section of a perianth in upper third, x 45.

The figures were all drawn from the Nicaragua specimens collected by K. Hamilton (No. 225).

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[12] Hedwigia **33**: *pl. 7, f. 8–10.* 1894.